Use Case Driven Requirements and Reference Design Development in a Collaborative Environment to Accelerate Commercial Adoption of Interoperable Devices and Systems

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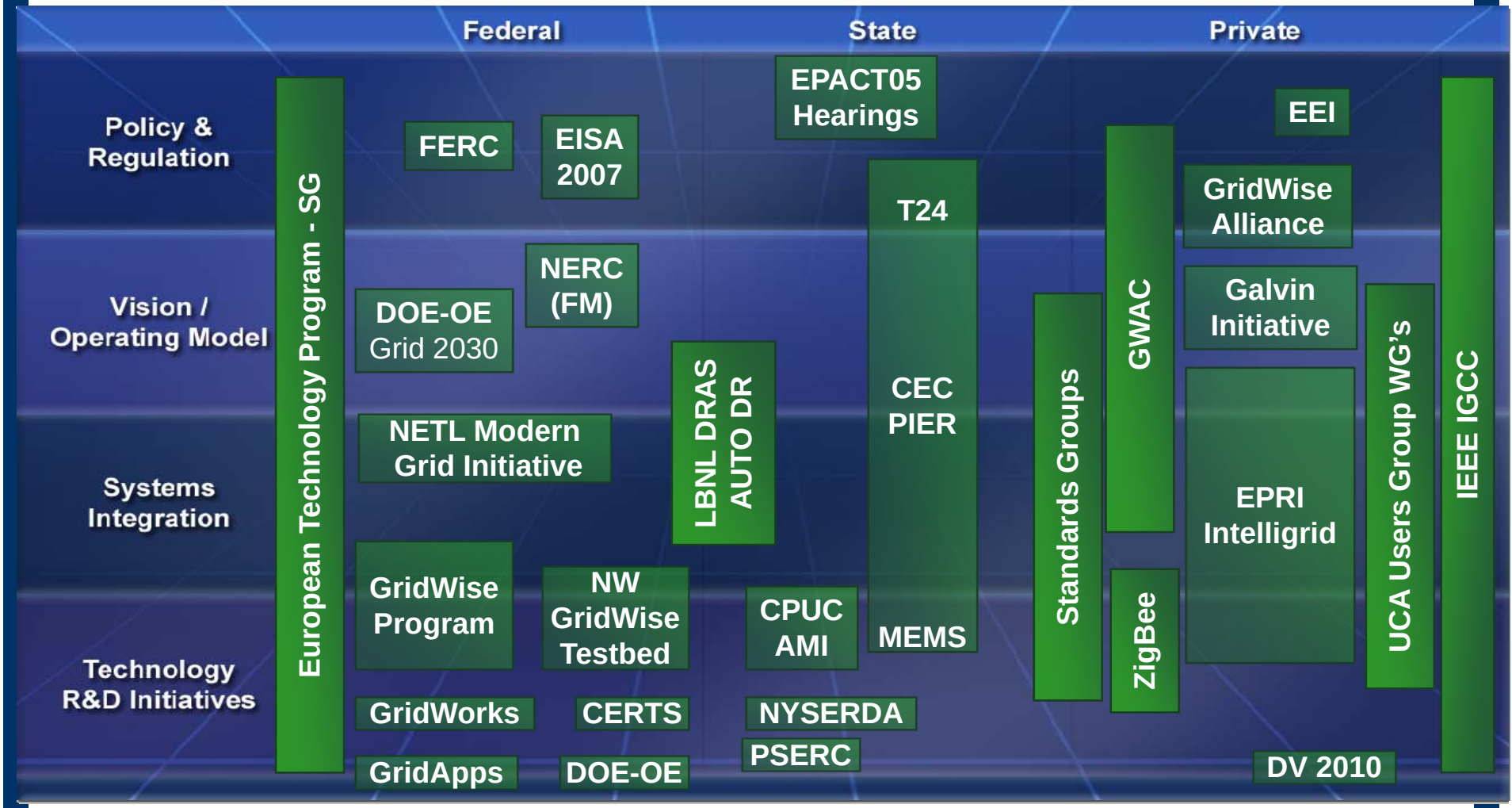
Smart Grid Collaboration



PCT Reference Design Project

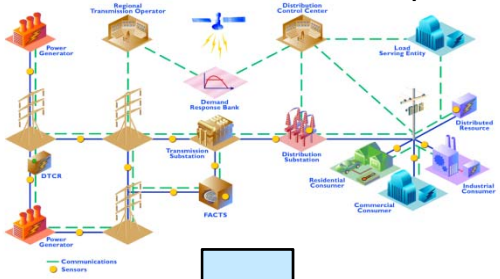
- **Utilize a use case based requirements development process to**
  - Identify and engage stakeholders
  - Determine interoperability interfaces
  - Develop minimal information exchange model
  - Document the results as a reference design
- **Validate with UC Berkeley prototype**
- **Coordinate with other organizations**

PCT Reference Design WG

- Monthly meetings from mid 2006 through mid 2007
- > 100 registered members on the email exploder
- 30+ participants on each call
- 5+ active writers / contributors

Development Process

Initial Ideas and Concepts



Reviews

Draft Use Cases for Architecture

Scenarios of vision and future operations functions

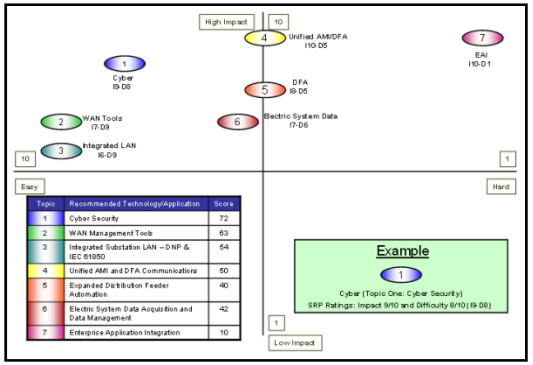
Stakeholders Review

Iterate

Iterate

Reference Requirements Sources

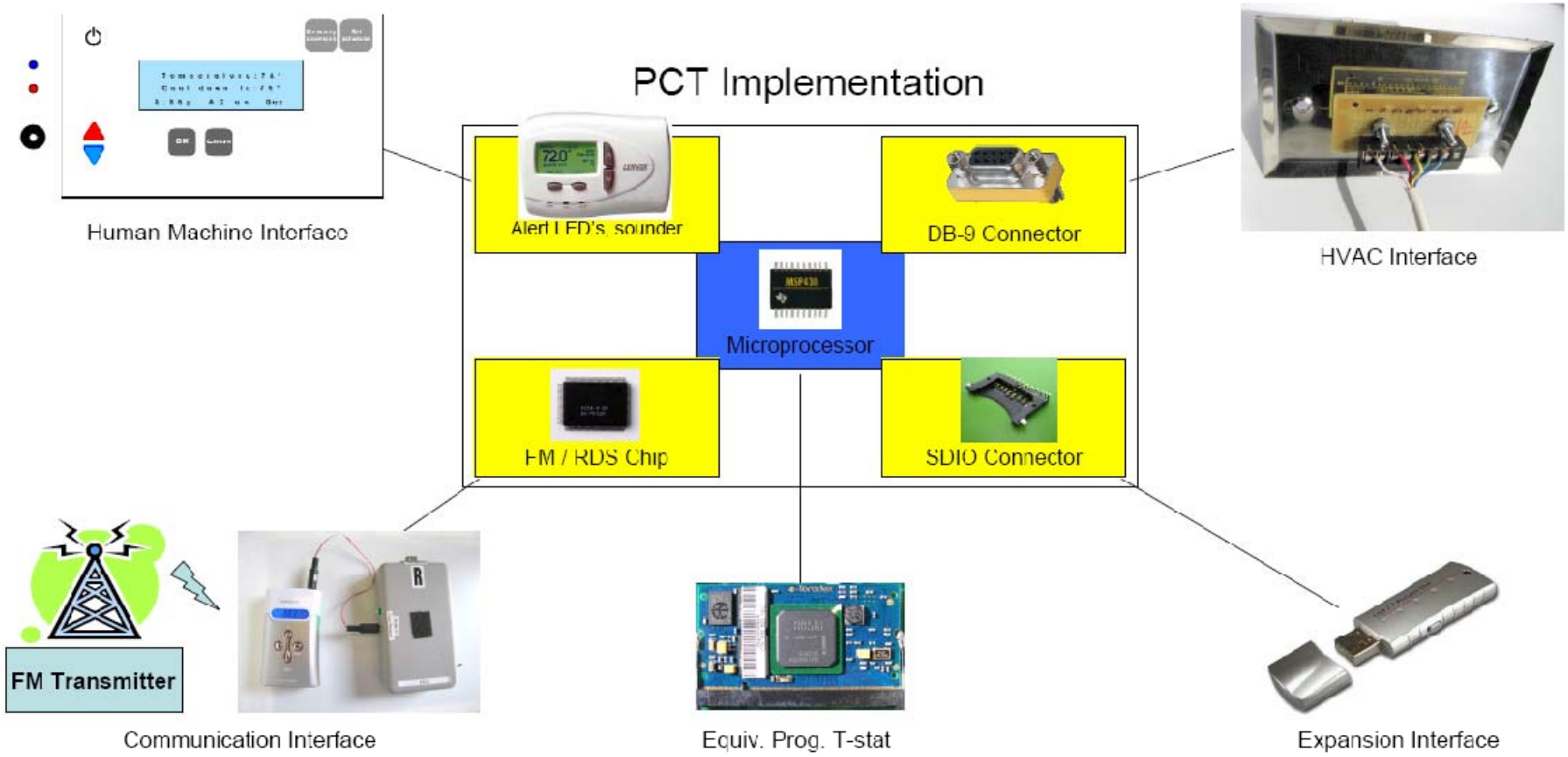
Project Team Develop Initial Drafts



Gap Analysis, Technology Evaluation and Ranking

Architecture including Information Model, Interfaces, and Reference Design

PCT Reference Design



PCT WG -> OpenHAN Evolution

- Spawned / influenced by CEC PCT effort
- Utility driven requirements development
- Vendor involvement significant as advisors
- Used and evolved the same development process
- Started in early 2007
- Core task was to develop the UtilityAMI 2008 HAN System Requirements Specification

HAN Guiding Principles

Capabilities

- Supports a secure two way communication with the meter
- Supports load control integration
- Provides direct access to usage data
- Provides a growth platform for future products which leverage HAN and meter data
- Supports three types of communications: public price signaling, consumer specific signaling and control signaling
- Supports distributed generation and sub-metering

Assumptions

- ***Consumer owns the HAN****
- Meter to HAN interface is based on open standards
- Implementation is appropriate given the value and the cost
- Technology obsolescence does not materially impact the overall value

OpenHAN Device Mapping Example

Requ. ID	OpenHAN System Requirements	Energy Services Interface	PCT	Display	EMS	Load Control	HAN Electric Meter	HAN Meter (non-electric)	Smart Appliance
App.Control.1	HAN Device shall accept control signals from the Utility.	NA	B	B	B	B	B	B	B
App.Control.2	HAN Device shall respond to requests to cease operational state (e.g., open contact).	NA	B	NA	B	B	NA	NA	E
App.Control.3	HAN Device shall respond to requests to resume operational state (e.g., close contact).	NA	B	NA	B	B	NA	NA	E
App.Control.4	HAN Device shall acknowledge receipt of control signal.	NA	B	NA	B	B	NA	NA	E
App.Control.5	HAN Device shall acknowledge execution of control request.	NA	B	NA	B	E	NA	NA	O
App.Control.6	HAN Device shall acknowledge execution failure of request (i.e., exceptions).	NA	E	NA	E	E	NA	NA	O
App.Control.7	HAN Device shall signal any consumer-initiated overrides.	NA	B	NA	B	E	NA	NA	O
App.Control.8	HAN Device shall respond to request to cease operation state at a specific time.	NA	B	NA	B	E	NA	NA	O

UtilityAMI 2008 HAN SRS Ratification Vote Unanimous – Mar 7, 2008

- AEP
- SCE
- SDG&E
- PG&E
- Detroit Edison
- FPL
- BC Hydro
- Entergy
- Consumers Energy
- CenterPoint Energy
- Encor
- EDF

Additional utilities are expected to ratify the document

Editorial changes in progress – publicity blitz imminent

Lessons Learned

- **Smart Grid "space" too large for any one organization, standard, or other entity to dominate**
- **Collaboration and information exchange is critical to efficiently move the industry forward**
- **Scenario (use case) driven requirements capture and architecture development has proven to be effective**
  - Well defined requirements from key stakeholders can and has influenced the vendor community

Questions???